Complete Summary

GUIDELINE TITLE

Evidence-based clinical practice guideline. Neonatal skin care.

BIBLIOGRAPHIC SOURCE(S)

Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN). Neonatal skin care. Evidence-based clinical practice guideline. Washington (DC): Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN); 2001 Jan. 54 p. [148 references]

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
QUALIFYING STATEMENTS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY

SCOPE

DISEASE/CONDITION(S)

Alterations in skin integrity

GUIDELINE CATEGORY

Evaluation
Prevention
Risk Assessment
Treatment

CLINICAL SPECIALTY

Nursing
Pediatrics

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Health Care Providers
Nurses

GUIDELINE OBJECTIVE(S)

- To present evidence-based clinical practice recommendations to registered nurses (RNs) and advanced practice registered nurses (APRNs) for neonatal skin care with the goal of optimizing neonatal skin integrity
- To describe evidence-based approaches to accomplish the following:
    - Assess the neonate's skin condition
    - Identify neonates who are or may be at risk for alterations in skin integrity
    - Recognize environmental and treatment-related agents that may alter neonatal skin integrity
    - Implement interventions to promote and protect optimal skin function
    - Support normal skin development
    - Minimize the potential for future skin sensitization

TARGET POPULATION

Healthy as well as high-risk and sick neonates (birth to 28 days of age) of all gestational ages, excluding neonates with congenital skin disorders.

INTERVENTIONS AND PRACTICES CONSIDERED

1. Newborn skin assessment and risk factor identification for skin injury. Skin culture per order if infection suspected
2. Bathing, including first bath, routine bathing and immersion bathing
3. Cord care (e.g., cleansing with neutral pH cleanser or sterile water, diaper folding)
4. Circumcision care (e.g., povidone iodine or chlorhexidine; water post procedure; covering circumcised penis with petrolatum or petrolatum gauze; use of antimicrobial ointment)
5. Use of disinfectants (e.g. povidone iodine or chlorhexidine; sterile water post procedure) (Note: use of isopropyl alcohol is considered, but specifically not recommended)
6. Measures to prevent and/or treat diaper dermatitis (e.g., frequent diaper changes; zinc-oxide barrier; alcohol-free pectin paste covered with petrolatum or zinc oxide; antifungal ointment/cream as ordered; avoidance of specific products)
7. Use of emollients (preservative-free, petrolatum based emollient)
8. Use of adhesives (e.g., semipermeable dressings, pectin barriers, hydrogel adhesive electrocardiogram or limb electrodes, stretchy wraps)
9. Measures to minimize transepidermal water loss (e.g., servo-regulated incubators, humidifiers, transparent adhesive dressing to body, emollient to body surfaces)
10. Measures to prevent skin breakdown (e.g., water, air, gelled mattresses; cotton surfaces, sheepskin; transparent dressing; emollients)

11. Measures to treat skin breakdown (Irrigation with sterile water or diluted sterile saline; antifungal ointment per order; petrolatum; transparent dressing, hydrogel, hydrocolloid dressings for discrete wounds)
12. Measures to prevent intravenous infiltration (insertion devices with plastic or silicone catheters; use of transparent adhesive/clear tape)
13. Measures to treat intravenous infiltration (stopping infusion/elevating site; administering therapeutic agents/antidotes per order; avoidance of measures that may aggravate skin)
14. Measures to promote skin nutrition (e.g., appropriate protein, fat, and caloric intake; zinc supplementation; lipid supplementation)

MAJOR OUTCOMES CONSIDERED

- Condition of neonate´s skin (e.g., dryness, erythema, breakdown, rashes) as evaluated using Neonatal Skin Condition Score (NSCS)
- Signs of skin infection or bacterial colonization
- Cord separation time
- Incidence of irritant diaper dermatitis
- Incidence of transepidermal water loss and/or heat loss
- Nutritional status of neonate

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The literature was derived predominately from the body of work used to create the original Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and Neonatal Association of Neonatal Nurses (NANN) Neonatal Skin Care RBP4 project guideline*. Several topic-specific electronic databases and manual searches were conducted to identify additional relevant, recently published literature needed to update the original RBP4 project guideline. For example, the MEDLINE and CINAHL databases were searched for journal articles on the topics of diaper dermatitis, emollient use, intravenous (IV) infiltration and immersion bathing. Additional articles were retrieved based on knowledge of critical or seminal works deemed necessary for inclusion in the Guideline.

*A comprehensive neonatal skin care guideline was formulated by the Association of Women´s Health, Obstetrics and Neonatal Nurses and the Neonatal Association of Neonatal Nurses RBP4 project science team in 1997 and was implemented and evaluated over a 1-year period at 51 sites throughout the United States.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Quality of Evidence

I: Evidence obtained from at least one properly designed randomized controlled trial.

II-1: Evidence obtained from well-designed controlled trials without randomization.

II-2: Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.

II-3: Evidence from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence.

III: Opinions of respected authorities, based on clinical experience, descriptive studies or reports of expert committees.

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

The Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) template for guideline development is based on the framework delineated in the American Nurses Association (ANA) Manual to Develop Guidelines (Marek KD, American Nurses Association Committee on Nursing Practices, Standards and Guidelines. Washington [DC]: American Nurses Publishing, American Nurses Foundation, American Nurses Association, 1995). The American Nurses Association Manual to Develop Guidelines models its process on that of the Agency for Healthcare Research Quality (AHRQ), formerly the Agency for Health Care Policy and Research (AHCPR).

Team members participated from July 2000 through March 2001 in teleconferences, literature review, evaluation and scoring of research articles and creation of the Evidence-Based Clinical Practice Guideline. A system and tool for scoring the literature was developed based on the method for literature analysis presented in the American Nurses Association Manual to Develop Guidelines (Marek, 1995). Using this framework, each study reviewed by the Guideline team was evaluated in the following eight categories:

1. Problem or question studied

2. Sampling
3. Measurement
4. Internal validity
5. External validity
6. Construct validity
7. Statistical conclusion validity
8. Justification for conclusions

A description of the above criteria and a sample scoring tool are presented in the guideline document. As the Evidence-Based Clinical Practice Guideline was further developed, the quality of the evidence supporting practice recommendations was determined by team consensus using the U.S. Preventive Services Task Force (1996) Guide to Clinical Preventive Services quality of evidence rating scale.

Using the original RBP4 project guideline as a template, the team reviewed and scored relevant literature according to the process described previously. Team members were then assigned to develop the following individual elements of the Evidence-Based Clinical Practice Guideline:

1. Newborn skin assessment
2. Bathing, including first bath, routine bathing and immersion bathing
3. Cord care
4. Circumcision care
5. Disinfectants
6. Diaper dermatitis
7. Adhesives
8. Transepidermal water loss (TEWL)
9. Skin breakdown
10. Intravenous infiltration
11. Skin nutrition

Weekly teleconferences enabled team members to review each of the above elements and achieve consensus on each clinical practice recommendation, accompanying referenced rationale and quality of evidence ratings.

Each clinical practice recommendation presented in the Guideline is supported by a referenced rationale using American Psychological Association (APA) format. The column headed Evidence Rating includes the quality of evidence ratings for each reference cited under the column headed Referenced Rationale. Full citations for all references are given in the reference list of the original guideline document.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Weekly teleconferences enabled team members to review each guideline element and achieve consensus on each clinical practice recommendation, accompanying referenced rationale and quality of evidence ratings.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

- This guideline was peer reviewed by a panel of Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and the National Association of Neonatal Nurses (NANN) member experts and a neonatologist with expertise in pediatric dermatology.
- Clinical implementation and pilot testing was conducted via AWHONNs Research Based Practice Project by nurses in selected sites in the United States.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Quality of Evidence Ratings (I-III) are defined at the end of the "Major Recommendations" field.

Newborn Skin Assessment

1. Assess neonatal skin daily using an objective tool whenever possible such as the Neonatal Skin Condition Score (NSCS) (refer to Appendix C in the original guideline document) (Lund, Osborne et al., 2001: Evidence Rating: II-3).
2. Identify risk factors for skin injury as applicable for individual patients. Risk factors may include but are not limited to the following:
    - Gestational age <32 weeks
    - Edema
    - Use of paralytic agents
    - Use of vasopressor
    - Use of endotracheal tubes, nasal continuous positive air way pressure, nasogastric/orogastric tubes
    - Vascular access devices
    - Numerous monitors, electrodes, probes
    - Surgical wounds
    - Ostomies
    - High frequency ventilators
    - Extracorporeal membrane oxygenation

(Lund, Osborne et al., 2001: Evidence Rating: II-3) (Holbrook, 1982; Darmstadt & Dinulos, 2000: Evidence Rating: III)

3. Determine potential causes of skin breakdown such as the following:
    - Adhesive removal
    - Burn/thermal injury
    - Abrasion/friction
    - Diaper dermatitis
    - Pressure ulcer
    - Infection

    (Lund et al., 1999: Evidence Rating: III)

4. If a purulent skin lesion is noted or infection is suspected, communicate with the primary health care provider (physician or neonatal nurse practitioner). Obtain skin culture and gram stain as ordered. A potassium hydroxide (KOH) prep may be useful for early detection of fungal infection in very-low-birthweight infants (Baley & Silverman, 1988; Rowen et al., 1995: Evidence Rating: III).

Bathing

First Bath

1. The first bath should be provided once the neonate's temperature has been stabilized and has remained within the normal range for 2-4 hours (Penny-MacGillivray, 1996: Evidence Rating: I).
2. Universal precautions including wearing gloves should be maintained until after the first bath (Penny-MacGillivray, 1996: Evidence Rating: I) (CDC, 1988: Evidence Rating: III).
3. Excessive vernix may be removed but removal of all vernix is not necessary for hygienic purposes (Darmstadt & Dinulos, 2000; Lund et al., 1999: Evidence Rating: III).

Routine Bathing

1. Bathe to remove debris. Daily soap bathing is discouraged during the neonatal period (Cowin & Frost, 1986: Evidence Rating: I) (Yosipovitch et al., 2000: Evidence Rating II-1) (Frank et al., 2000: Evidence Rating: II-2).
2. Select mild cleansing bars or liquid cleansers that have a neutral pH. Preference should be given to preservative-free products or products containing preservatives that have a demonstrated safety/tolerance profile. Water-only baths can be alternated with baths using cleansers (Gfatter et al., 1997: Evidence Rating: I) (Yosipovitch et al., 2000: Evidence Rating: II-1) (Cetta et al., 1991: Evidence Rating: III).
3. For preterm infants <32 weeks of gestation, clean skin surfaces gently using warm water only during the first week of life. Use soft materials such as cotton cloth or cotton balls. Avoid rubbing; water can be squeezed onto the skin during rinsing. If areas of skin breakdown are evident, use warm sterile water (Gfatter et al., 1997: Evidence Rating: I) (Frosch & Kligman, 1979; Tupker, Pinnagoda & Nater, 1990; Peters, 1998: Evidence Rating: II-1) (Morelli & Weston, 1987; Tupker et al., 1990: Evidence Rating: III).

4. Bathing is not an innocuous procedure. The benefits of daily bathing have not been clearly justified. Decisions about the frequency of bathing should be based on individual needs and consideration of family beliefs and values (Gfatter et al., 1997: Evidence Rating: I) (Yosipovitch et al., 2000: Evidence Rating: II-1).
5. Consider immersion bathing for stable infants once umbilical lines are discontinued (Anderson et al., 1995: Evidence Rating: II-1) (Darmstadt & Dinulos, 2000: Evidence Rating: III).

Immersion Bathing

Immersion bathing is placing the infant's entire body, except the head and neck, into a tub of water.

1. Consider immersion bathing as safe and effective method to achieve and maintain infant hygiene (Henningsson et al., 1981: Evidence Rating: I).
2. Selection of immersion bathing should be based on assessment of individual infant condition and needs:
    a. Stable preterm infants after the umbilical lines are discontinued
    b. Infants with the umbilical clamp in place

    (Penny-MacGillivray, 1996; Henningsson et al., 1981: Evidence Rating: I) (Peters, 1998: Evidence Rating: II-1) (Darmstadt & Dinulos, 2000: Evidence Rating: III)

3. Use a water depth of approximately 3 inches or deep enough to allow the infant to settle into the water with her/his shoulders well covered (Anderson et al., 1995: Evidence Rating: II-1).
4. Use a water temperature of 100.4 degrees Fahrenheit (Anderson et al., 1995: Evidence Rating: II-1).
5. Educate parents about bath safety and identify positive aspects of immersion bathing for infant comfort and development (Anderson et al., 1995: Evidence Rating: II-1).
6. After the bath:
    a. Dry the infant immediately, diaper, place cap on her/his head and double wrap in warm blankets.
    b. Approximately 10 minutes after the bath, dress the infant, change the cap and wrap her/him in dry, warm blankets.
    c. Clean and disinfect the tub and other equipment consistent with facility infection control protocols.

    (Varda & Behnke, 2000: Evidence Rating: I) (Anderson et al., 1995: Evidence Rating: II-1)

Cord Care

Immediate

1. Clean the cord and surrounding skin surface as needed with cleanser used for initial or routine bathing and rinse thoroughly or cleanse with sterile water (Gfatter et al., 1997: Evidence Rating: I).

Ongoing Cord Care

2. Keep the cord area clean and dry. If the cord becomes soiled with urine or stool, cleanse the area with water (Dore et al., 1998; Medves & O'Brien, 1997; Arad et al., 1981: Evidence Rating: I) (Pildes et al., 1973: Evidence Rating: II-1) (Johnson et al., 1976: Evidence Rating: II-2) (Zupan & Garner, 2000; Ford & Ritchie, 1999: Evidence Rating: III).
3. Educate staff and families about normal mechanism of cord healing (Dore et al., 1998: Evidence Rating: I) (Ford & Ritchie, 1999: Evidence Rating: III).
4. Teach parents or caregivers to keep area clean and dry, avoid contamination with urine and stool, keep diaper folded away from area and wash hands prior to handling infant's umbilical cord area.

Circumcision Care

1. Site preparation:
    a. Prepare the site with povidone iodine (PI) or chlorhexidine (CHG) solution.
    b. Following the procedure, completely remove any remaining povidone iodine with sterile water.
    c. Pay special attention to leg creases and the lower back and buttocks where pools tend to form during the procedure.

    (Mitchell et al., 1991: Evidence Rating: II-2)

2. Following the procedure, cover the penis with petrolatum-impregnated gauze strips or single package gauze pads and 1 oz. tubes of ointment for 24 hours (Smack et al., 1996: Evidence Rating: I) (Ghadially et al., 1992: Evidence Rating: II-1) (Gelbaum, 1993: Evidence Rating: III).
3. Antimicrobial ointments can be used but the benefits of bacitracin use should be evaluated against the potential for subsequent allergic contact dermatitis (Marks et al., 1995: Evidence Rating: II-2).

    Lubricants should not be used if the procedure is performed with a Plastibell™. This could cause the Plastibell™ to move out of place (Hollister Inc., 1992: Evidence Rating: III).

4. Cleanse newly circumcised penis with water for the first 3-4 days to prevent irritation (Darmstadt & Dinulos, 2000: Evidence Rating: III).

Disinfectants

1. Disinfect skin surfaces before invasive procedures such as intravenous tube insertion, umbilical vessel catheterization, chest tube insertion, intravenous puncture or heel sticks for laboratory samples (Maki et al., 1991; Mimoz et al., 1999: Evidence Rating: I) (Choudhuri et al., 1990: Evidence Rating: II-1) (Champagne et al., 1984; Malathi et al., 1993: Evidence Rating: II-2) (Garland et al., 1995: Evidence Rating: II-3).
2. Use chlorhexidine (CHG) or povidone iodine (PI) for skin disinfection. Remove with sterile water or saline after the procedure is complete (Branemark & Ekholm, 1967; Lineaweaver et al., 1985: Evidence Rating: II-1).

a. Apply chlorhexidine for 30 seconds or with two consecutive wipings (Maki et al., 1991; Mimoz et al., 1999: Evidence Rating: I) (Champagne et al., 1984; Garland et al., 1996: Evidence Rating: II-2) (Garland et al., 1995: Evidence Rating: II-3) (Maguire & Wisniewski, 2001; PDR, 2001: Evidence Rating: III).
b. Apply povidone iodine with two consecutive wipings. Allow to dry for 30 seconds (Maki et al., 1991: Evidence Rating: I) (Choudhuri et al., 1990: Evidence Rating: II-1) (Malathi et al., 1993; Mitchell et al., 1991; Parravinci et al., 1996; Smerdely et al., 1989: Evidence Rating: II-2) (Garland et al., 1995; Linder et al., 1997: Evidence Rating: II-3) (Gordon et al., 1995: Evidence Rating: III).
c. Avoid the use of isopropyl alcohol for initial skin preparation or for removing povidone iodine or chlorhexidine (Darmstadt & Dinulos, 2000; Harpin & Rutter, 1982; Schick & Milstein, 1981: Evidence Rating: III).

Diaper Dermatitis

1. To maintain optimal skin environment:
    a. Change diapers frequently
    b. Use diapers made with absorbent gel materials
    c. Discourage use of commercially available diaper wipes
    d. Encourage/support breastfeeding throughout infancy

    (Campbell et al., 1987; Davis et al., 1989: Evidence Rating: I) (Berg et al., 1986; Buckigham & Berg, 1986: Evidence Rating: II-2) (Berg, 1987; Rasmussen, 1987: Evidence Rating: III)

2. Prevention strategies for neonates at risk include the following:
    a. Use of petrolatum-based lubricants or barriers containing zinc oxide
    b. Avoiding the use of products not currently recommended for neonates, e.g., polymer barrier films

    (Davis et al., 1989: Evidence Rating: I) (Darmstadt & Dinulos, 2000; Lund et al., 1999; 3M Health Care, 2000: Evidence Rating: III)

3. Treat significant skin excoriation from contact irritant diaper dermatitis by the following methods:
    a. Identify and treat the underlying cause
    b. Protect injured skin with thick application of barrier containing zinc oxide
    c. Use an alcohol-free, pectin-based layer covered with petrolatum or zinc oxide ointment if other therapy is ineffective

    (Darmstadt & Dinulos, 2000; Lund, 1999: Evidence Rating: III)

4. Identify Candida albicans diaper rash by presence of red satellite lesions/culture. This rash will become more intense if covered by occlusive ointments. Treatment includes antifungal ointments or creams. A Candida rash can also be left exposed to air and light (Rasmussen, 1987: Evidence Rating: III).

5. Use of powders in the hospital nursery is unnecessary and is not recommended to treat diaper dermatitis (Smack et al., 1996: Evidence Rating: I) (Darmstadt & Dinulos, 2000; Farrington, 1992: Evidence Rating: III).
6. Use of antibiotic ointments is not recommended and is generally unnecessary for routine care of common primary irritant diaper dermatitis.

Adhesives

1. Use adhesives sparingly to secure life support, monitoring and other devices in all newborns (Weber et al., 1987: Evidence Rating: I) (Lund et al., 1997: Evidence Rating: II-1) (Harpin & Rutter, 1983: Evidence Rating: II-2) (Lund, Osborne et al., 2001: Evidence Rating: II-3).
2. Use semipermeable dressings to anchor silicone catheters, peripheral intravascular devices, other central venous catheters, nasal cannulas and nasal or oral gastric tubes (Darmstadt & Dinulos, 2000; Kuller & Lund, 1998: Evidence Rating: III).
3. Consider using pectin barriers or hydrocolloid adhesive products to act as a barrier along with tape (McLean et al., 1992; Dollison & Beckstrand, 1995: Evidence Rating: I) (Lund et al., 1997: Evidence Rating: II-1) (Lund et al., 1986: Evidence Rating: III).
4. Use wraps such as stretchy gauze to anchor electrodes, probes and limbs to arm boards (Kuller, 1995: Evidence Rating: III).
5. Use electrocardiogram or limb electrodes containing hydrogel adhesive (Webster & McCosker, 1994: Evidence Rating: I) (Lund et al., 1997: Evidence Rating: II-1) (Darmstadt & Dinulos, 2000; Malloy & Perez-Woods, 1991: Evidence Rating: III).
6. Minimize contact between adhesive tape and skin by "backing" tape or applying cotton to adhesive (Harpin & Rutter, 1983: Evidence Rating: II-2).
7. Alcohol-free skin protectant may be applied on term infants >30 days of age to provide a protective interface between the skin and bodily wastes, fluids, adhesive products and friction (Irving, 2001; 3M Health Care, 2000: Evidence Rating: III).
8. Remove adhesives slowly and carefully using water-soaked cotton balls. Pull tape on a horizontal plane, folding tape back onto itself while continuously wetting the adhesive-skin interface. Alternatively, use mineral oil or petrolatum to loosen tape unless retaping is necessary at that site (Evans & Rutter, 1986: Malloy & Perez-Woods, 1991; Lund et al., 1999; Hoath & Narendran, 2000: Evidence Rating: III).
9. Avoid the use of the following products:
    a. Solvents
    b. Enhancing bonding agents
    c. Adhesive bandages after drawing laboratory samples

    (Rodeaver, 1989: Evidence Rating: II-3) (Plaas, 1997; Rutter, 1987: Ittman & Bozynski, 1993; Holbrook, 1982; Gill, 1982; Gordon & Montgomery, 1996; Evans & Rutter, 1986b: Evidence Rating: III)

Emollients

1. Emollients may be used to decrease transepidermal water loss (TEWL) in premature neonates (Nopper et al, 1996: Evidence Rating: I).

2. Emollients may be used to protect or restore skin integrity (Lane & Drost, 1993; Smack et al., 1996: Evidence Rating: I) (Ghadially et al., 1992: Evidence Rating: II-1) (Darmstadt & Dinulos, 2000: Evidence Rating: III) as follows:
    a. As a preventive therapy, initiate emollient use at 24-48 hours of age or as needed. Apply a preservative-free, water-miscible, petrolatum-based emollient sparingly (0.5 - 1.5 ml) to all body surfaces, excluding head, face and scalp, every 12 hours or as needed (Nopper, 1996; Pabst et al., 1999: Evidence Rating: I).
    b. At the first sign of dryness, fissures or flaking, apply an emollient every 12 hours or as needed (Lane & Drost, 1993: Evidence Rating: I) (Ghadially et al., 1992: Evidence Rating: II-1).
    c. Choose products without perfumes, dyes or preservatives (Cetta et al., 1991: Evidence Rating: III).
    d. Apply gently to skin, especially with very-low-birthweight neonates, and avoid friction (Darmstadt & Dinulos, 2000: Evidence Rating: III).
    e. Observe carefully for development of systemic infections, such as coagulase negative staphylococcus infections, especially in neonates <750 g (Edwards, et al., 2000: Evidence Rating: I) (Campbell et al., 2000: Evidence Rating: II-3).
3. Emollients should be dispensed from a hospital pharmacy in unit dose or patient-specific containers. Every effort should be made to maintain sterility of the emollient container. All surrounding treatment surfaces that may be contaminated by emollients should be thoroughly cleaned (Campbell et al., 2000: Evidence Rating: II-3) (Darmstadt & Dinulos, 2000: Evidence Rating: III).
4. Emollients may interfere with adherence of adhesives (Lane & Drost, 1993: Evidence Rating: I) (Darmstadt & Dinulos, 2000: Evidence Rating: III).
5. Emollients may be used during phototherapy while under radiant heater (Nopper et al., 1996: Evidence Rating: I) (Darmstadt & Dinulos, 2000: Evidence Rating: III).

Transepidermal Water Loss

1. Use a single technique or combination of techniques to reduce transepidermal water loss and minimize evaporative heat loss in premature infants <30 weeks of gestation (Harpin & Rutter, 1983; Kalia et al., 1998: Evidence Rating: II-2) (Agren et al., 1998: Evidence Rating: II-3) (Sedin et al., 1985; Omar et al., 1999: Evidence Rating: III).
2. The following techniques have been shown to be effective in reducing transepidermal water loss:
    a. An occlusive polyethylene bag covering body torso and extremities may be used immediately after delivery during stabilization to reduce the postnatal temperature decrease caused by excessive evaporative heat loss. Remove the wrapping after the neonate has been stabilized in the delivery room and admitted to the neonatal intensive care unit (NICU) (Vohra et al., 1999: Evidence Rating: I).
    b. Maintain at least 40% relative humidity (RH) for comfort and to prevent excessive drying to skin surfaces (Kjartansson et al., 1995: Evidence Rating: II-1) (Hammarlund & Sedin, 1979: Evidence Rating: II-2).

c. Move infant to double-walled incubator after stabilization or employ strategies to increase relative humidity in area immediately surrounding the infant on a radiant warmer (Bell et al., 1980; LeBlanc, 1982: Evidence Rating: II-1).
d. Use supplemental conductive heat from water-filled pads or heated water mattresses to reduce heater output from radiant warmers (Topper & Stewart, 1984: Evidence Rating: II-1).
e. Use polyethylene plastic blankets or tents to reduce transepidermal water loss and evaporative heat loss. Plastic wraps should not be in contact with skin surfaces for prolonged periods (Baumgart, 1984; Baumgart et al., 1982; Fitch & Korones, 1984; Aly et al., 1978: Evidence Rating: II-1) (Marks et al., 1977: Evidence Rating: II-3) (LeBlanc, 1991: Evidence Rating: III).
f. Provide humidity at levels 70% relative humidity or higher for the first 7 days of life (Silverman & Blanc, 1957: Evidence Rating: I) (Hammarlund & Sedin, 1979; Harpin & Rutter, 1985: Evidence Rating: II-2).
g. After the first week, continue humidity at 50-60% until the infant reaches 30-32 weeks post conceptional age (Kalia et al., 1998: Evidence Rating: II-2) (Agren et al., 1998: Evidence Rating: II-3).
h. Use servo-controlled humidification systems that actively heat and evaporate water separately from circulating heat rather than the passive "tray" type of humidification (Drucker & Marshall, 1995; Marshall, 1997: Evidence Rating: III).
i. Apply transparent adhesive dressings to the body surfaces to reduce transepidermal water loss. Skin disruption occurs when they are removed, and removal should be delayed as long as possible (Bustamante & Steslow, 1989; Donahue et al., 1996: Evidence Rating: I) (Knauth et al., 1989; Mancini et al., 1994; Vernon et al., 1990: Evidence Rating: II-1).
j. Apply preservative-free, water-miscible, petrolatum-based emollient to all surfaces except head and face every 6 hours to reduce transepidermal water loss (Nopper et al., 1996; Pabst et al., 1999: Evidence Rating: I).

<u>Skin Breakdown</u>

1. Prevent skin breakdown by using any of the following methods:
    a. Products/devices to prevent pressure sores such as the following:
        - Water mattresses
        - Air mattresses
        - Gelled mattresses and pads
        - Sheepskin
    b. Transparent dressing over bony prominences such as knees and elbows to prevent friction injuries
    c. Petrolatum or petrolatum-based ointments applied to the groin and thigh of very low-birthweight infants

(Irving, 1999; Darmstadt & Dinulos, 2000; Kuller, 1995; Lund et al., 1999; Kuller & Lund, 1998: Evidence Rating: III)

2. Treat skin breakdown and excoriations using one or more of the following methods (Irving, 1999: Evidence Rating: III):
    a. Obtain skin cultures, Gram stains and potassium hydroxide preparations from erythematous or purulent excoriations to evaluate for infection as ordered by the primary health care provider (Baley & Silverman, 1988; Rowen et al., 1995: Evidence Rating: III).
    b. Cleanse the affected area using sterile water or normal saline diluted 1:1 with sterile water every 4-6 hours; a 20 ml syringe with a blunt needle or polytetrafluoroethylene (Teflon) catheter can be used to gently debride the area of exudates (Lineaweaver et al., 1985: Evidence Rating: II-1) (Krasner et al., 1993; Lund et al., 1999; Rodeaver, 1989: Evidence Rating: III).
    c. Antifungal ointment can be used for fungal infections. Systemic treatment may be indicated for very-low-birthweight infants who have positive skin cultures for yeast, whose respiratory status is unstable or who have thrombocytopenia (Baley & Silverman, 1988; Rowen et al., 1995: Evidence Rating: III).
    d. If extensive bacterial colonization is suspected, antibiotic ointment such as mupirocin nasal treatment, polymyxin B, zinc bacitracin polymyxin or neomycin may be used sparingly every 8-12 hours (Smack et al., 1996: Evidence Rating: I) (Marks et al., 1995: Evidence Rating: II-2) (Lund et al., 1999: Evidence Rating: III).
    e. Petrolatum-based ointments can be used over uninfected or infected lesions after cleansing and application of antibacterial ointment. Do not use over fungal lesions (Nopper et al., 1996; Smack et al., 1996; Edwards et al., 2000: Evidence Rating: I) (Ghadially et al., 1992: Evidence Rating: II-1).
    f. Transparent adhesive dressings, hydrogel and hydrocolloid dressings can be used for discrete wounds or large denuded areas (Mancini et al., 1994: Evidence Rating: II-1) (Krasner et al., 1993; Lund et al., 1999; Irving, 1999: Evidence Rating: III).

Intravenous Infiltration

Intravenous infiltration is the unplanned leaking/administration of an infusing nonvesicant solution or medication into the surrounding tissue. Extravasation is the unplanned administration of an infused vesicant or blistering agent into the tissue. In this Guideline, infiltration refers to both intravenous (IV) infiltration and extravasation.

1. The following interventions are recommended to minimize the risk of infiltration:
    a. Use insertion devices covered with plastic/silicone catheters instead of steel needles (Pettit & Hughes, 1993: Evidence Rating: III).
    b. Avoid placing intravenous tubes in areas difficult to immobilize whenever possible, especially those near areas of flexion or surrounding tendons, nerves or arteries (Upton et al., 1979: Evidence Rating: III).
    c. Secure intravenous devices with transparent adhesive dressing or clear tape so the insertion site is clearly visible (Brown et al., 1979: Evidence Rating: II-3) (Kuller & Lund, 1998: Evidence Rating: III).

d. Place tape loosely over bony prominences to prevent obstruction of venous return (Brown et al., 1979: Evidence Rating: II-3).
e. In peripheral intravenous lines, limit glucose concentrations to 12.5% and amino acid concentration to 2%. Dilute medications as much as possible before administration (Falcone et al., 1989: Evidence Rating: III).
f. Assess the catheter insertion site and perfusion to the area distal to the catheter insertion, with appropriate documentation, at least hourly (Brown et al., 1979: Evidence Rating: II-3) (Flemmer & Chan, 1993; Malloy & Perez-Wood, 1991; Zenk, 1981: Evidence Rating: III).
g. If signs of infiltration are noted, stop the infusion immediately. Signs and symptoms of infiltration include swelling, pain at the site, coolness of skin, leakage at the site, erythema, blistering and, in some cases, the lack of a blood return. In severe cases, there may be blanching of the overlying skin, blister formation and subsequent skin sloughing (Montgomery et al., 1999; Pettit & Hughes, 1993; Glass & Giacoia, 1987: Evidence Rating: III).

2. Nonpharmacologic interventions for intravenous infiltration may include but are not limited to the following:
    a. Elevate the site of an intravenous infiltration or the affected extremity (Banta & Noerr, 1992; Pettit & Hughes, 1993: Evidence Rating: III).
    b. Make multiple puncture holes over the areas of greatest swelling and squeeze or let the extravasated fluid leakout of the tissue to remove the infiltrate and prevent skin sloughs. This procedure should only be performed according to primary health care provider order (Chandavasu et al., 1986; Glass & Giacoia, 1987: Evidence Rating: III).
3. Pharmacologic interventions for intravenous infiltration may include the following:
    a. Administer the appropriate therapeutic agent as soon as possible but no later than 12-24 hours after the infiltrate is identified, as ordered by the primary health care provider (Brown et al., 1979: Evidence Rating: II-1) (Montgomery et al., 1999: Evidence Rating: III).
    b. Hyaluronidase may be administered via the intravenous cannula before removal or as a subcutaneous injection, if ordered by the primary care provider. The standard dose is 15 units. After cleansing the site, subcutaneously administer 4-5 0.2 ml injections in a circular pattern around the peripheral edge of the infiltration. Dilute a 150-unit vial of hyaluronidase in 1 ml of normal saline; then take 0.1 ml of this solution and further dilute to 1 ml (Laurie et al., 1984; Raszka et al., 1990: Evidence Rating: II-1) (Banta & Noerr, 1992; Few, 1987; Zenk, 1981; Flemmer & Chan, 1993: Evidence Rating: III).
        - Hyaluronidase may be given directly through the affected catheter in a dose of 1 ml of the 15 U/ml solution. Pull back the intravenous catheter or needle 1-2 mm to remove it from the vein while leaving it in the subcutaneous tissue. Inject the hyaluronidase through the catheter, then remove the catheter (Flemmer & Chan, 1993; Glass & Giacoia, 1987; Zenk, 1981: Evidence Rating: III).
    c. Phentolamine is the antidote for infiltration of alpha-adrenergic agents or those causing vasoconstriction such as dopamine or norepinephrine. The recommended dose is 0.5 mg diluted to 1 ml, delivered subcutaneously around the periphery of the infiltration in 4-5 0.2 ml

injections after the removal of the intravenous catheter (Friedman, 1998; Zenk, 1981: Evidence Rating: III).

4. For an extensive infiltration, consultation with a plastic surgeon or dermatologist may be considered per primary health care providers orders (Glass & Giacoia, 1987; Pettit & Hughes, 1993: Evidence Rating: III).
5. The following interventions have been reported in the literature, but their use in the neonatal population is discouraged because of the lack of research, potential for toxicity or other detrimental effects (West et al., 1981: Evidence Rating: III):
    a. Topical application of silver sulfadiazine cream to the wound (Brown et al., 1979: Evidence Rating: II-3) (Friedman, 1998; US Parma Drug Info, 2000: Evidence Rating: III).
    b. Topical application of heat or cold (Glass & Giacoia, 1987; Montgomery et al., 1999: Evidence Rating: III).
6. Topical 2% nitroglycerin ointment, 4 mm/kg, may be applied directly to the site of severe skin ischemia in term infants >21 days of age with intact skin (Wong, McCollough et al., 1992; Harpin & Rutter, 1983: Evidence Rating: II-3) (Denkler & Chan, 1989; Flemmer & Chan, 1993: Evidence Rating: III).

Skin Nutrition

1. Provide overall nutritional care for neonates (Casey & Hambidge, 1985; Darmstadt, 1998: Evidence Rating: III).
2. Give nutritional supplements parenterally as ordered, including lipids, trace minerals including zinc and multivitamins, if the infant is premature or unable to tolerate enteral nutrients after 7 days of life (Dixon, 1987; Friedman, 1980; Hunt et al., 1978; Zoltkin & Buchanan, 1983: Evidence Rating: III).
3. Consider higher zinc supplementation for specific pathologic conditions (Reifen & Zlotkin, 1993; Zlotkin & Buchanan, 1983; Lund et al., 1999: Evidence Rating: III).
4. Administer intravenous lipids as ordered at 0.5-1.0g/kg/day to prevent essential fatty acid deficiency in newborns who cannot digest adequate amount of enteral nutrients (Hunt et al., 1978: Evidence Rating: II) (Lund et al., 1999: Evidence Rating: III).
5. Administer zinc supplementation for infants requiring parenteral nutrition:

    Term: <3 months: 250 mcg/kg/day; >3 months: 100 mcg/kg/day;

    Premature: 400mcg/kg/day

    (Zenk, 1999: Evidence Rating: III).

6. The following trace element dosages are recommended: Term: 0.2 ml/kg/day; Preterm: 0.2 ml/kg/day, with an additional 200 mcg/kg/day of zinc to provide the recommended intake (Zenk, 1999: Evidence Rating: III).
7. In some cases, exclusively breastfed infants may require oral zinc supplements (Heinan et al., 1995; Zimmerman et al., 1982: Evidence Rating: III).

Refer to the original guideline document for detailed referenced rationales for each clinical practice recommendation.

Quality of Evidence

I: Evidence obtained from at least one properly designed randomized controlled trial.

II-1: Evidence obtained from well-designed controlled trials without randomization.

II-2: Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.

II-3: Evidence from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence.

III: Opinions of respected authorities, based on clinical experience, descriptive studies or reports of expert committees.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Guideline implementation may help optimize neonatal skin integrity by preventing, minimizing, or treating conditions of dryness, erythema, breakdown, rashes, skin infection, and transepidermal water loss/or heat loss; by improving cord separation time; and by promoting positive skin nutrition.

POTENTIAL HARMS

- Use of antimicrobial ointments is associated with an increased risk of allergic contact dermatitis.
- All disinfectants have the potential for damaging tissue.

- Petrolatum emollient may increase the risk of coagulase negative staphylococcus epidermidis infection. The benefits of emollient use for prevention of dermatitis and skin breakdown should be weighed against the risk of infections.
- Povidone iodine can be adsorbed, causing significant elevations in plasma total iodine and alterations in thyroid function in premature and term newborns.

Subgroups Most Likely to be Harmed:

- Neonates <750 g are at greater risk of coagulase negative staphylococcus epidermidis infection following use of petrolatum emollient.
- Transparent adhesive dressing should not be used on infected wounds because bacteria and fungus can proliferate under this type of dressing.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- The guideline was developed for the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and the National Association of Neonatal Nurses (NANN) as a resource for nursing practice. The guideline does not define a standard of care, nor is it intended to dictate an exclusive course of management. It presents general methods and techniques of practice that are currently acceptable, based on current research and used by recognized authorities. Proper care of individual patients may depend on many individual factors as well as professional judgment.
- The guideline developer has tried to ensure that drug classifications and selections set forth in this text are in accordance with current recommendations and practice at the time of publication. However, in view of ongoing research, changes in government regulations and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check other available evidence published in referenced resources for each drug for any change in indications and dosages and for added warnings and precautions. This is particularly important when a recommended agent is a new or infrequently employed drug.
- The information presented in this guideline is not designed to define standards of practice for employment, licensure, discipline, legal or other purposes. Variations and innovations that are consistent with law, and that demonstrably improve the quality of patient care should be encouraged.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

A comprehensive neonatal skin care guideline was formulated by the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and National Association of Neonatal Nurses (NANN) RBP4 project science team in 1997 and was implemented and evaluated over a 1-year period at 51 sites throughout the United States. The goals of reducing traumatic injury, protecting immature barrier

function and promoting skin integrity were essential components of the project guideline.

The process of implementation and evaluation and the project results summarized in the guideline are described in detail in the companion articles by Lund, Kuller et al. (2001) and Lund, Osborne et al. (2001) in the Journal of Obstetric, Gynecologic, and Neonatal Nursing (see "Companion Document" field). Participants included 51 site coordinators and the nurses who worked at the selected sites in neonatal intensive care units, special care unit nurseries, and well-baby nurseries in 51 hospitals. The institutions represented academic centers, community hospitals and children's hospitals. The average daily census was 33 infants (range 358) in the neonatal intensive care unit sites and 18 infants (range 445) in the well-baby nurseries.

In a focused training session, volunteer site coordinators were briefed about how neonatal skin differs from adult skin and about key elements from the RBP4 project guideline. Site coordinators were also given a full-color slide presentation kit to use as a teaching tool that accurately described the project guideline content. A video, Principles of Infant Skin Care, was also available to site coordinators on request (Johnson & Johnson Baby Products Division, 1995). In-service presentations, staff meetings and bedside teaching were reported most frequently as strategies used for orientation to and implementation of the project guideline.

Evaluation included collecting information about the skin condition, care environment and other influences on skin integrity such as medications, nutrition and climate. Site coordinators were instructed to make twice-weekly observations of newly admitted patients to their units over an 8-week period before the site coordinators' training session. A second period of observation of newly admitted patients occurred after the site coordinators implemented the skin care guideline in their individual units. The following tools were used for data collection and evaluation:

1. Patient demographic tool to collect basic information about the patients observed, including birthweight, gestational age, race and diagnosis for each patient.
2. Twice-weekly skin assessment tool to obtain a "snapshot" of newborn skin condition and daily care practices. Skin condition was assessed using the Neonatal Skin Condition Score (NSCS), which uses a 9-point scale to assess skin dryness, erythema and breakdown. The NSCS is shown in Appendix C of the guideline document. The scoring system was adapted from a visual scoring system used in a previous study. This tool continues to undergo reliability and validity testing.

The rigorous process of twice-weekly skin assessments for newly admitted patients, required by participation in the project, contributed to staff education and enhanced implementation. The assessments also proved helpful for the site coordinators, as they learned the value of objectively assessing the condition of patients' skin integrity over time and noted clinical differences related to using a consistent skin care guideline.

Registered nurses participating in the project were tested about their knowledge of skin care practices before and after implementation of the project guideline. Site coordinators also provided a comprehensive list of products used for neonatal skin care in their institutions both before and after guideline implementation.

A total of 2,820 neonates were observed during the pre- and postguideline implementation phases of the project: 1,464 in neonatal intensive care unit/special care unit nursery settings and 356 in well-baby nurseries, accounting for 11,468 observations in the neonatal intensive care unit/special care unit nursery and 628 in well-baby nurseries. The racial and sociocultural makeup of the sample reflected a diverse population. See the guideline document for specific results pertaining to skin condition, bathing, emollient use, adhesives, diaper dermatitis, umbilical cord care, and transepidermal water loss.

In summary, the results showed an improvement in skin condition and changes in clinical practice consistent with project guideline recommendations. In addition, the skin scoring system and inventory of environmental and care items correlated well with skin condition and patient outcomes and can assist nurses in identifying risk factors for impaired skin integrity in the neonatal population.

The results demonstrate the effectiveness and feasibility of implementing an evidence-based, neonatal skin care practice guideline in a variety of acute-care settings for premature and full-term neonates. The participating sites reflect a diverse geographic distribution, as well as different types of acute-care hospitals, including academic, private and children's hospitals. The positive outcomes reported from the large sample of newborns assessed in this project support the safety and efficacy of using the project guideline in daily skin care practices for neonates. The Evidence-Based Clinical Practice Guideline is based on the RBP4 project guideline and has been updated and expanded to include new sections on immersion bathing and intravenous infiltration. The Guideline presents an optimal outline of care components for which evidence is available. The degree to which implementation of particular guideline elements is required is a matter of nursing and medical judgement based on evaluation of the neonatal patient population served and individual infant's needs.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN). Neonatal skin care. Evidence-based clinical practice guideline. Washington (DC): Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN); 2001 Jan. 54 p. [148 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2001 Jan

GUIDELINE DEVELOPER(S)

Association of Women's Health, Obstetric, and Neonatal Nurses - Professional Association

SOURCE(S) OF FUNDING

Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN)

GUIDELINE COMMITTEE

Evidence-based Clinical Practice Guideline Development Team

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Evidence-based Clinical Practice Guideline Development Team: Joanne Kuller, RN, MS, Co-Team Leader; Deborah A. Raines, PhD, RNC, Co-Team Leader; Sheila Ecklund, RNC, MSN; Martha S. Folsom, RNC, BSN; Carolyn Lund, RN, MS, FAAN; Donna M. Rothwell, BScN.

Reviewers: Patricia A. Creehan, RNC, MSN; Alfred T. Lane, MD, FAAP; Judith Wright Lott, RNC, DNS, NNP.

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

An update is not in progress at this time

GUIDELINE AVAILABILITY

Electronic copies: Not available at this time.

Print copies: Available by contacting the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), 2000 L Street, N.W. Suite 740, Washington, D.C. 20036; Phone: (800) 354-2268; Web site: www.awhonn.org.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Washington (DC): Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), 2001 Jan. Neonatal skin care. Quick care guide. 2001 Jan. 1 p.
- Lund CH, Osborne JW, Kuller J, Lane AT, Lott JW, Raines DA. Neonatal skin care: clinical outcomes of the AWHONN/NANN evidence-based clinical practice guideline. Association of Women's Health, Obstetric and Neonatal Nurses and the National Association of Neonatal Nurses. J Obstet Gynecol Neonatal Nurs. 2001 Jan-Feb;30(1):41-51.
- Lund CH, Kuller J, Lane AT, Lott JW, Raines DA, Thomas KK. Neonatal skin care: evaluation of the AWHONN/NANN research-based practice project on knowledge and skin care practices. Association of Women's Health, Obstetric and Neonatal Nurses/National Association of Neonatal Nurses. J Obstet Gynecol Neonatal Nurs. 2001 Jan-Feb;30(1):30-40.
- Lund C, Kuller J, Lane A, Lott JW, Raines DA. Neonatal skin care: the scientific basis for practice. J Obstet Gynecol Neonatal Nurs. 1999 May-Jun;28(3):241-54.

Electronic copies: Not available at this time.

Print copies: Available by contacting the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), 2000 L Street, N.W. Suite 740, Washington, D.C. 20036; Phone: (800) 354-2268; Web site: www.awhonn.org.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on April 9, 2002. The information was verified by the guideline developer on June 7, 2002.

COPYRIGHT STATEMENT

Date Modified: 11/15/2004